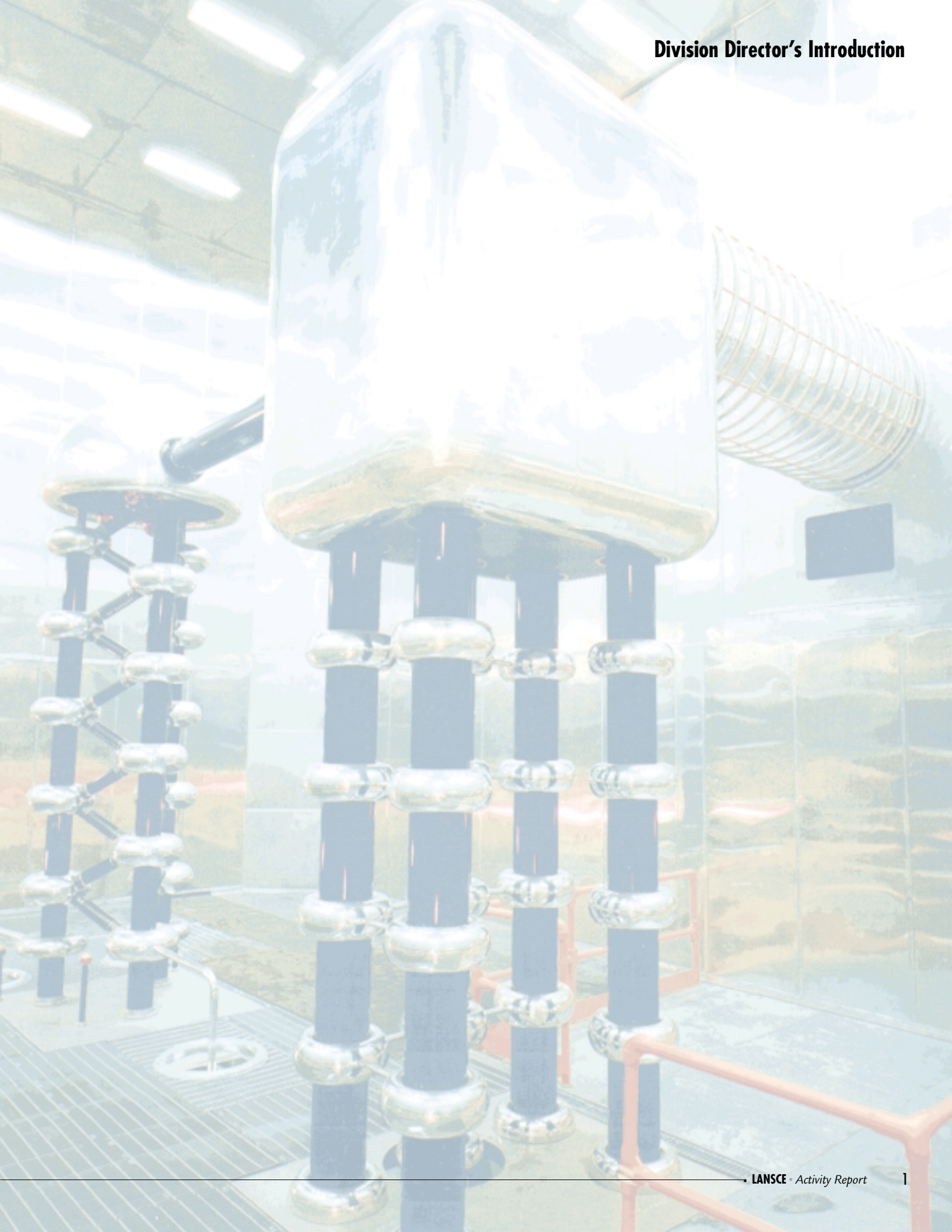
Division Director's Introduction



A Division with a Mission

We have seen the realization of many of our dreams for LANSCE Division over 1999 and 2000:

- proton radiography has developed from a concept to an operational technology, resulting in the first radiographic "movie" of an implosion and which has direct impact on the certification of the nuclear stockpile;
- the plutonium (n,2n) cross section has been measured, solving a 55-year-old problem and enabling accurate use of data from past nuclear tests;
- neutron resonance spectroscopy has revealed for the first time, both the temperature and particle velocities within a shocked metal;
- agreement has been achieved between theory and multiparticle simulation for halo formation in proton beams;
- the world's highest density of bottled ultra-cold neutrons has been achieved using a novel solid deuterium source;
- the Lujan Center is the first spallation neutron source to exploit coupled moderators, which have increased its cold neutron flux by a factor of between 2.5 and 4, depending on wavelength;
- four new spectrometers for neutron scattering have been built at the Lujan Center by teams involving many universities (including all but one of the University of California campuses);
- researchers at LANSCE achieved the highest ever self-amplified spontaneous emission gain for an infrared free-electron laser;
- an engineering solution has been found for the Proton Storage Ring instability, allowing a record 9.7 μC per pulse of protons to be accumulated; and
- the largest high-power proton materials irradiation ever undertaken was accomplished, providing essential data for the design of future intermediate-energy proton spallation targets.

These and many other scientific and technical achievements are described in more detail in this Activity Report. What is perhaps less evident from the report are the successes LANSCE Division has had in modernizing both its infrastructure and the way we operate.

The LANSCE User Facility is "mature." The first protons were accelerated by the linac in June 1972—on the birthday of the man who had supervised its construction, Louis Rosen. Since that time, the mission of the accelerator complex has evolved from meson physics to a multidisciplinary tapestry of stockpile stewardship, neutron scattering, nuclear science, and isotope production. Over the years, new equipment was added to accomplish these missions, but the LANSCE physical infrastructure and the way we operate did not keep pace with the evolution of standards for the construction and operation of such facilities. To correct some of the more serious problems, we have constructed over the past two years a new, five-million-dollar radioactive liquid waste treatment facility and a new cooling tower. We removed large quantities of legacy waste from past activities, recycled over 2000 tons of steel, completely refurbished the proton radiography area, and removed 11 rather decrepit transportable buildings. As part of our vision of becoming a world-class user facility for defense and civilian research, we have improved safety and implemented a much more formal style of operation.

These improvements did not come easily. Early in 1999, a series of "near misses" convinced us of the need for a cultural change in the way we operate our experimental facilities—one that would improve not only the safety, but also the predictability and reliability of all operations at LANSCE. As a result, LANSCE Division spent four months of 1999 correcting over 2500 safety-related deficiencies and improving our operating procedures. Later in the year, we discovered that radioactive liquid waste drains below the Lujan Center had been partially blocked since the construction of the facility over 20 years ago and that a foul concoction of radioactive spallation products and other chemicals had accumulated. Cleaning up this mess was a real test of our ability to coordinate personnel from many divisions to perform complex, one-of-a-kind tasks under the scrutiny of a regulatory agency. In spite of the inherent hazards of the activity, our employees rose to the challenge and completed the work without a single safety incident. As other neutron scattering facilities around the world begin to experience the inevitable consequences of age and the public distrust of all things nuclear, LANSCE will reap the benefits of having begun a journey of modernization.

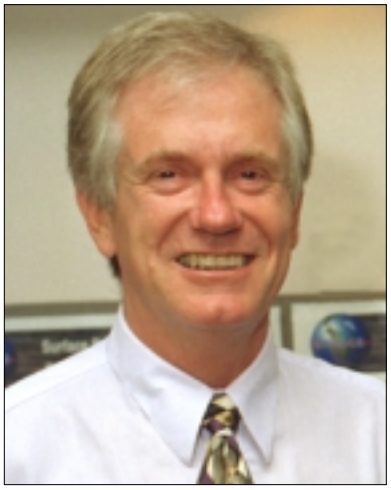
Users are at the *raison d'etre* for the LANSCE accelerator facility. At the WNR and the new proton radiography facilities, we have helped more users than ever over the past two years. They were able to accomplish more than 60 proton radiography shots with 100% reliability and to benefit from a doubling of the instantaneous beam current to the WNR facility. Unfortunately, users of the Lujan Center were not so fortunate. During the

two calendar years covered by this report, the Lujan Center only operated for a total of 7 months, rather than the 14 months we had planned. This was mainly a result of a requirement dictating the need for a complete reevaluation of the hazards associated with the Lujan Center spallation target, which is now designated a "Category-3 nuclear facility." In spite of this, Lujan Center users have been extremely supportive and the LANSCE Users Group Executive Committee has provided advice and input to all levels of Los Alamos and DOE management to help move the Lujan Center forward. I believe the neutron scatterers are about to be rewarded for their patience—the modernization of our infrastructure and operating culture, coupled with the spectrometer and accelerator upgrades that are coming on-line, will allow the Lujan Center to serve well the national research community for the coming decade.

As the National Academy report on *"Cooperative Stewardship: Operating the Nation's Multidisciplinary User Facilities"* points out, world-class user facilities maintain their edge by performing ongoing research and development in the areas of their underpinning technologies. For LANSCE, those technologies are high-power accelerators and spallation sources. LANSCE and its predecessor organizations have nurtured for many years a group of world-class accelerator scientists, providing the key personnel for projects such as the Accelerator Production of Tritium (APT) and the Spallation Neutron Source (SNS) and contributing to defense technologies such as high-power microwaves. The achievement of 100 mA of protons through a 6.7-MeV accelerator for APT and the design of a radio-frequency power source based on integrated-gate bipolar transistor technology for the SNS are evidence of the stature of LANSCE's accelerator technologists. They are a unique resource for the DOE and the nation for both defense and civilian sectors.

It has been a rewarding experience over the past three years leading LANSCE Division towards its vision of ***Solving National Problems Using High-Intensity Accelerators and Spallation Neutron Sources.*** In the future, I look forward to interacting with the Division's many talented and dedicated people in different ways, as I work within the University of California to encourage new users into the field of neutron scattering.

Roger Pynn



↑*Roger Pynn, LANSCE Division Director from November 1997 to January 2001.*